

# A retrospective study of 230 consecutive patients hospitalized for presumed travel-related illness (2000–2006)

H. Leroy · C. Arvieux · J. Biziragusenyuka ·  
J. M. Chapplain · C. Guiguen · C. Michelet · P. Tattevin

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**Abstract** A good knowledge of morbidity profiles among ill-returned travelers is necessary in order to guide their management. We reviewed the medical charts of 230 patients hospitalized in one infectious diseases department in France for presumed travel-related illnesses. The male-to-female ratio was 1.6 and the median age was 33 years (interquartile range [IQR], 25–50). Most patients (70.9%) were returning from sub-Saharan Africa. The median duration of travel was 28 days (IQR, 15–60) and the median time from return of travel to hospitalization was 13 days (IQR, 7–21). Malaria was the most frequent diagnosis (49.1%), which was especially encountered in patients returning from sub-Saharan Africa (95.6%), without adequate chemoprophylaxis (78.2%). Imported diseases at risk of secondary transmission were also diagnosed, including pulmonary tuberculosis ( $n=8$ ), viral hepatitis ( $n=8$ ), typhoid fever ( $n=6$ ), human immunodeficiency virus (HIV) (six new diagnosis), non-typhoid salmonellosis ( $n=5$ ), severe acute respiratory syndrome, and Crimean-Congo hemorrhagic fever. This study underlines the need to maintain tropical expertise for infectious diseases physicians, even in Europe.

## Introduction

In 2006, the number of international tourist arrivals was estimated at 846 million, with an average annual growth of 4.2% between 1995 and 2006. Europe was, by far, the main region concerned, with more than 460 million international arrivals [1]. Approximately 8% of travelers to the developing world require medical care during or after travel [2]. A good knowledge of morbidity profiles among ill-returned travelers is necessary in order to guide their management and to orient data collection and investigations [3, 4]. However, most morbidity studies performed to date examined specific diseases, specific destinations [5], specific types of travelers [6–8], or included outpatients [2, 9–12]. Few studies have focused on ill-returned travelers who require hospital admission after their return [13–15]. We performed a retrospective study of all consecutive ill-returned travelers admitted in one department of infectious diseases in France.

## Materials and methods

Pontchaillou is a university-affiliated hospital which serves as a referral center for the area of Rennes, Bretagne, Western France. Our department includes a conventional unit of 22 single-bed rooms and an intensive care unit (ICU) of 21 beds. In 2003, five rooms were equipped for respiratory isolation with negative pressure (four in the conventional unit and one in the ICU). Patients were identified with our computerized database system, using the code “stay in tropical area.” Patients were included if they were older than 16 years, and were admitted between January 2000 and March 2006 for a presumed travel-related illness after traveling to another continent (i.e., patients

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H. Leroy · C. Arvieux · J. Biziragusenyuka · J. M. Chapplain ·  
C. Michelet · P. Tattevin  
Infectious Diseases and Intensive Care Unit,  
Pontchaillou University Hospital,  
Rennes, France

C. Guiguen  
Parasitology, Pontchaillou University Hospital,  
Rennes, France

P. Tattevin (✉)  
Clinique des Maladies Infectieuses, CHU Pontchaillou,  
35033 Rennes Cedex, France  
e-mail: pierre.tattevin@chu-rennes.fr

were admitted because of symptoms that were presumed by the physician in charge to be travel-related). Data were extracted from medical charts, including demographic variables, travel characteristics (duration, purpose of travel, countries visited, date of return), malaria chemoprophylaxis, diagnostic workout, and outcome. Travel destinations were classified as follows: sub-Saharan Africa, Southeast Asia, North Africa, South and Central America, South Central Asia, the Caribbean, and others. The reasons for travel were classified as: tourism, business, visiting friends and relatives (VFR), missionary or volunteer purpose, and unknown. Final diagnoses were extracted from the discharge summary.

## Results and discussion

During the study period, the code “stay in a tropical area” was recorded for 264 hospitalizations. Thirty-four were excluded because no discharge summary was available ( $n=20$ ), the final diagnosis was clearly unrelated to travel ( $n=12$ ), or the same patient was admitted twice for the same diagnosis related to the same travel ( $n=2$ , i.e., recurrent fever attributed to *Plasmodium vivax*). Therefore, 230 patients (141 male, 89 female) were studied, returning from 51 different countries. Patients’ characteristics are summarized in Table 1. Forty-nine patients (21.3%) were classified as migrants living in France, of whom, 16 (32.7%) were admitted after VFR in sub-Saharan Africa, four (8.2%) in North Africa, and four (8.2%) in Southeast Asia. The time from return of travel to admission could be extracted from

**Table 1** Characteristics of patients admitted after transcontinental travel ( $n=230$ )

Characteristic	Value
Age (years): median [interquartile range (IQR)]	33 [25–50]
Female sex (% of travelers)	38.7
Duration of travel (days): median [IQR]	28 [15–60]
Time from travel to admission (days)	13 [7–21]
Reason for travel ( $n$ [%])	
Tourism	90 [52.3]
Business	47 [27.6]
Visiting friends and relatives (VFR)	17 [10]
Missionary or volunteer purposes	14 [8.2]
Unknown	2 [26]
Destination ( $n$ [%])	
Sub-Saharan Africa	163 [70.9]
Southeast Asia	22 [9.6]
North Africa	18 [7.8]
South and Central America	10 [4.3]
South Central Asia	7 [3]
Caribbean	7 [3]
Others (Polynesia, Australia, China)	3 [1.3]

medical charts for 215 patients (93.5%). It was less than one month (30 days) for 162 patients (75.3%), between one and six months for 30 patients (14.0%), between six months and one year for four patients (1.9%), and more than one year for 19 patients (8.8%). The most common diagnoses among the 23 patients who were admitted more than six months after their return were human immunodeficiency virus (HIV) infection ( $n=6$ ), tuberculosis ( $n=5$ ), malaria (*P. ovale*,  $n=2$ ) and viral hepatitis ( $n=2$ ). Of the 230 patients, 105 (45.7%) were referred from the emergency department of our institution, 60 (26.1%) were directly admitted into

**Table 2** Etiology and frequency of illness in ill-returned travelers

Diseases	$n^*$ (% of patients)
Malaria	113 (49.1%)
<i>Plasmodium falciparum</i>	99
<i>P. vivax</i> ( $n=7$ ), <i>P. ovale</i> ( $n=6$ ), <i>P. malariae</i> ( $n=1$ )	14
Enteric and liver	57 (24.8%)
Bacteria	30
Typhoid fever	6
Non-typhoidal <i>Salmonella</i> spp.	5
<i>Shigella</i> sp.	2
Presumptive bacterial cause	17
Virus	14
Hepatitis C virus (chronic)	4
Hepatitis B virus	3
Hepatitis A virus	1
Presumptive viral cause	6
Parasites	10
Amebiasis	5
Nematodes	5
Unknown	3
Urinary tract	8 (3.5%)
Acute pyelonephritis	7
Urinary schistosomiasis ( <i>S. mansoni</i> )	1
Respiratory tract	34 (14.8%)
Presumed bacterial pneumonia	11
Acute bronchitis	8
Pulmonary tuberculosis	8
Influenza-like illness	3
Others (including one legionellosis)	3
Severe acute respiratory syndrome (SARS)	1
Miscellaneous	40 (17.4%)
HIV infection	10
Skin and soft-tissue infections	8
Meningitis	5
Extra-pulmonary tuberculosis	5
Rickettsiosis	4
Leptospirosis	3
Dengue	2
Crimean-Congo hemorrhagic fever	1
Cryptococcal meningitis	1
<i>Mycobacterium leprae</i>	1

\*Total number of diagnoses=265

the infectious diseases unit, 25 (10.9%) were transferred from another institution, 20 were directly admitted in the ICU, 14 were transferred from another department of our institution, and six were admitted through medical evacuation. The main reason why patients were admitted was fever, found in 176 patients (76.5%). The diagnoses repartition is presented in Table 2. Malaria was mostly diagnosed in patients returning from sub-Saharan Africa (95.6%). Data on malaria chemoprophylaxis was available for 101 patients, of whom, only 22 (21.8%) were appropriate according to national guidelines. Seven patients were admitted in the ICU, of whom, one died of severe malaria. Of the 13 patients with tuberculosis, eight had pulmonary tuberculosis and five had extra-pulmonary tuberculosis. Cultures were positive in 12 cases. Of the ten HIV-infected patients, four were aware of their HIV infection before admission.

During the past 25 years, a new specialty of travel medicine has evolved to address the health of the growing population of travelers [4], both before (pre-travel advice, immunization [16]) and after their travel (consultation, hospitalization [3]). With the constant increase in transcontinental traveling [1], physicians practicing in Europe, in particular, infectious diseases specialists, must be aware of the spectrum of diseases that affect ill-returned travelers. Optimal evaluation requires an understanding of the common etiologies and their epidemiology [3, 4, 11]. In our study, malaria accounted for approximately one half of all admissions (49.3%), mostly related to *Plasmodium falciparum* acquisition in sub-Saharan Africa. The predominance of malaria diagnosis in this study could be expected, as most patients (76.5%) presented with fever, and most (70.9%) were returning from sub-Saharan Africa. Previous studies have shown that malaria is, by far, the main cause of systemic febrile illness among travelers returning from sub-Saharan Africa [9]. In the three large-scale studies that focused on hospitalized returned travelers, malaria was always the most common diagnosis, affecting 62 patients out of 232 in Australia (26.7%) [14], 70 patients out of 147 in Italy (47.6%) [13], and 461 out of 613 patients (75.2%) in Southern France [15]. In our study, antimalarial prophylaxis was sub-optimal or absent in 78.2% of patients with malaria, which is similar to the rates recorded in the Italian (80%) and Australian (82%) studies [13, 14], and slightly better than in Southern France (>99%) [15]. Previous studies have documented that migrants undertaking VFR in sub-Saharan Africa are both the most at risk for malaria and the least likely to receive pre-travel advice [5–8]. This outlines the urgent need to further develop pre-travel advice targeting these populations [17]. Apart from malaria, the range of diseases encountered during this study is wide, including severe infections at risk of secondary transmission if undiagnosed, such as pulmonary tuberculosis ( $n=8$ ), viral hepatitis ( $n=8$ ), typhoid fever ( $n=6$ ), HIV

(six new diagnoses in travelers during the study period), non-typhoid salmonellosis ( $n=5$ ), SARS and Crimean-Congo hemorrhagic fever (one case each, previously described [18–20]). This study was limited by its reliance on retrospective data collection and by the bias introduced by its inclusion criteria (i.e., “presumed” travel-related hospitalization). However, it illustrates the wide spectrum of diseases in hospitalized ill-returned travelers in Europe and underlines the need to maintain tropical expertise for infectious diseases specialists. Although malaria predominates, many other tropical diseases may be encountered, some carrying public health threats. A substantial proportion of these diseases may be prevented by validated protective measures.

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## References

1. United Nations World Tourism Organization (UNWTO) (2007) UNWTO: tourism highlights. Available online at: <http://www.unwto.org/facts/eng/highlights.htm>
2. Hill DR (2000) Health problems in a large cohort of Americans traveling to developing countries. *J Travel Med* 7(5):259–266
3. Spira AM (2003) Assessment of travellers who return home ill. *Lancet* 361(9367):1459–1469
4. Ryan ET, Wilson ME, Kain KC (2002) Illness after international travel. *N Engl J Med* 347(7):505–516
5. Casalino E, Le Bras J, Chaussin F, Fichelle A, Bouvet E (2002) Predictive factors of malaria in travelers to areas where malaria is endemic. *Arch Intern Med* 162(14):1625–1630
6. Schlagenhauf P, Steffen R, Loutan L (2003) Migrants as a major risk group for imported malaria in European countries. *J Travel Med* 10(2):106–107
7. Leder K, Tong S, Weld L, Kain KC, Wilder-Smith A, von Sonnenburg F, Black J, Brown GV, Torresi J; GeoSentinel Surveillance Network (2006) Illness in travelers visiting friends and relatives: a review of the GeoSentinel Surveillance Network. *Clin Infect Dis* 43(9):1185–1193
8. Fenner L, Weber R, Steffen R, Schlagenhauf P (2007) Imported infectious disease and purpose of travel, Switzerland. *Emerg Infect Dis* 13(2):217–222
9. Freedman DO, Weld LH, Kozarsky PE, Fisk T, Robins R, von Sonnenburg F, Keystone JS, Pandey P, Cetron MS; GeoSentinel Surveillance Network (2006) Spectrum of disease and relation to place of exposure among ill returned travelers. *N Engl J Med* 354(2):119–130
10. Ansart S, Perez L, Vergely O, Danis M, Bricaire F, Caumes E (2005) Illnesses in travelers returning from the tropics: a prospective study of 622 patients. *J Travel Med* 12(6):312–318
11. Bottieau E, Clerinx J, Schrooten W, Van den Enden E, Wouters R, Van Esbroeck M, Vervoort T, Demey H, Colebunders R, Van Gompel A, Van den Ende J (2006) Etiology and outcome of fever after a stay in the tropics. *Arch Intern Med* 166(15):1642–1648
12. Wilson ME, Weld LH, Boggild A, Keystone JS, Kain KC, von Sonnenburg F, Schwartz E; GeoSentinel Surveillance Network (2007) Fever in returned travelers: results from the GeoSentinel Surveillance Network. *Clin Infect Dis* 44(12):1560–1568

13. Antinori S, Galimberti L, Gianelli E, Calattini S, Piazza M, Morelli P, Moroni M, Galli M, Corbellino M (2004) Prospective observational study of fever in hospitalized returning travelers and migrants from tropical areas, 1997–2001. *J Travel Med* 11(3):135–142
14. O'Brien D, Tobin S, Brown GV, Torresi J (2001) Fever in returned travelers: review of hospital admissions for a 3-year period. *Clin Infect Dis* 33(5):603–609
15. Parola P, Soula G, Gazin P, Foucault C, Delmont J, Brouqui P (2006) Fever in travelers returning from tropical areas: prospective observational study of 613 cases hospitalised in Marseilles, France, 1999–2003. *Travel Med Infect Dis* 4(2):61–70
16. Spira AM (2003) Preparing the traveller. *Lancet* 361(9366):1368–1381
17. Chen LH, Wilson ME, Schlagenhauf P (2007) Controversies and misconceptions in malaria chemoprophylaxis for travelers. *JAMA* 297(20):2251–2263
18. Desenclos JC, van der Werf S, Bonmarin I, Levy-Bruhl D, Yazdanpanah Y, Hoen B, Emmanuelli J, Lesens O, Dupon M, Natali F, Michelet C, Reynes J, Guery B, Larsen C, Semaille C, Mouton D, André M, Escriou N, Burguière A, Manuguerra JC, Coignard B, Lepoutre A, Meffre C, Bitar D, Decludt B, Capek I, Antona D, Che D, Herida M, Infuso A, Sauri C, Brückner G, Hubert B, LeGoff D, Scheidegger S (2004) Introduction of SARS in France, March–April, 2003. *Emerg Infect Dis* 10(2):195–200
19. Tarantola A, Nabeth P, Tattevin P, Michelet C, Zeller H; Incident Management Group (2006) Lookback exercise with imported Crimean-Congo hemorrhagic fever, Senegal and France. *Emerg Infect Dis* 12(9):1424–1426
20. Jauréguiberry S, Tattevin P, Tarantola A, Legay F, Tall A, Nabeth P, Zeller H, Michelet C (2005) Imported Crimean-Congo hemorrhagic fever. *J Clin Microbiol* 43(9):4905–4907